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Multiple self-care behaviors and associated factors in community-dwelling patients with hypertension in Myanmar

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ABSTRACT

This study aimed to identify the prevalence of self-care behaviors and the associated factors among hypertensive patients in primary care in Myanmar. This cross-sectional study was conducted from April to May 2019 among 410 hypertensive patients in Myitkyina Township, Kachin State, Myanmar. Hypertensive patients aged 30–70 years old and being registered at the community health centers in Myitkyina Township were selected using multi-stage cluster random sampling. Self-care behaviors were measured by Hypertensive Self-Care Activity Level Effect (H-SCALE). Chi-square test and multiple logistic regression analysis were used to explore the associated factors. Prevalence of adherence to multiple self-care behaviors were low: avoidance of tobacco use at 50.2%, followed by physical activity at 24.9%, medication at 24.1%, weight management at 9.5%, and healthy diet at 2.7%, while abstinence from harmful alcohol drinking was high at 97.8%. Multiple logistic regression analysis indicated that younger patients, low family income, inadequate knowledge, and no comorbidity were associated with non-adherence to medication. Living in rural area and having poor self-efficacy were associated with non-adherence to weight management, while being younger, female and having poor self-efficacy were also associated with non-adherence to physical activity. Compared with Kachin, other ethnics were more likely to be non-adherent to avoidance of tobacco use. Although a majority of respondents were not harmful drinkers, adherence to medication, healthy diet, physical activity, weight management and avoidance of tobacco use were very low. Health practitioners should provide education programs for hypertensive patients to direct them towards practical techniques in managing their blood pressure.

Keywords: self-care behaviors, hypertension, Myanmar

Abbreviations:
AOR: Adjusted odd ratio
ASEAN: Association of South-east Asia nations
BMI: Body mass index
CI: Confident interval
DASH: Diet approach to stop hypertension
NCD: Non-communicable diseases

NS: Not significant
WHO: World Health Organization

INTRODUCTION

Non-communicable diseases (NCD) accounted for 40.5 million of deaths globally in 2016 and about 18 million of NCD-related deaths were due to cardiovascular diseases including hypertension.[1] Hypertension becomes the first leading risk factor for global deaths.[2] The global burden of hypertension was estimated at around 1.4 billion in 2010.[3] Prevention of hypertension is thus critically important due to the large number of individuals that are globally impacted. World Health Organization (WHO) suggests that adherence to self-care behaviors among patients with hypertension is one way to better control hypertension,[4,5] because self-care behaviors among patients with hypertension play a critical role in reducing high blood pressure and preventing further complications.[6-8] The seventh joint national committee on the prevention, detection, evaluation and treatment of high blood pressure recommended six self-care behaviors: adherence to medication, engagement in adequate physical activity, following healthy diets that are low in fat and salt which is similar to dietary approaches to stop hypertension (DASH), maintenance of a healthy body weight, avoidance of tobacco use, and abstinence from harmful alcohol drinking.[4]

Republic of the Union of Myanmar is located in Southeast Asia. It is composed of 14 different regions spreading over diverse geographical areas living people with differences in ethnics, cultures, food habits and dietary patterns.[9] In Myanmar, hypertension is highly prevalent and cardiovascular diseases are the leading causes of deaths.[10] In 2014, national survey of diabetes mellitus and risk factors for non-communicable diseases in Myanmar reported that approximately one-fourth of adults had hypertension.[11] In 2018, WHO also estimated that 23% of adults in Myanmar had hypertension which was the second highest prevalence rate among the member countries of Association of South-east Asia Nations (ASEAN).[10] Despite the high prevalence in Myanmar, control rate of high blood pressure is considerably low, that is, 34.9% of people who were already diagnosed of hypertension were on treatment.[11]

Many studies on hypertension have been done in developing countries[11-14] including Myanmar.[9,15] To the best of our knowledge, a few studies however investigated hypertensive self-care behaviors in Myanmar, such as medication adherence[16] and health behaviors.[17] Furthermore, they were conducted only in Yangon, which is the largest city of Myanmar. Thus, limited information at the community level is available. Therefore, to better understand self-care behaviors, this study aimed to identify the prevalence of multiple self-care behaviors and the associated factors based on social cognitive theory[18] in hypertensive patients in Myanmar. The findings of this study may provide some valuable insights on how to promote self-care behaviors for better hypertension treatment and control among patients living in Kachin State, Myanmar. It may further help to reduce unconditional probability of dying between ages 30–70 years from cardiovascular diseases which may lead to achieve the target 3.4 of sustainable development goals in Myanmar.[19]

METHODS

Study Design and Participants

This cross-sectional study was carried out using a face to face interview. Participants were selected by means of multi-stage random cluster sampling of hypertensive patients aged 30–70

years in Myitkyna Township, Kachin State, Myanmar between April and May 2019. Myitkyina is the capital city of Kachin State which is located in northern part of Myanmar. The area of this city is 8061.1 square kilometer and population density is 34.16 per square kilometer. People living in this city are minority ethnics such as Kachin, Shan, and other ethnics such as Burmese, Nepali and Chinese. The sample size was estimated using a confidence interval of 95%, an acceptance error of 5%, and prevalence of adherence to medication is 50%.[16] With total estimated target population in the township (N = 2,567), the required sample size was 336. The sample size was increased to 402 which accounts for 10% probable non-response.

Multi-stage cluster random sampling method was used to select the subjects. There are 2 urban health centers and 6 rural health centers in Myitkyina Township. First, 1 urban health center and 4 rural health centers were randomly selected. Each urban health center has their own catchment areas (wards), and so has rural health centers (villages). Thus, 3 wards of selected health center in urban area were randomly selected. For rural area, 3 sub-centers were selected from each selected rural health center and then, 1 village from each selected sub-rural health center was randomly chosen. In total, 3 wards (urban areas) and 12 villages (rural areas) had been randomly selected. As the last step, hypertensive patients aged 30–70 years who had already been diagnosed of hypertension and received medical treatment during the previous 1 year were included (n = 2,567). Patients registered for hypertensive treatment in health centers were identified through out-patient medical records in selected health centers and eligible participants were selected by means of simple random sampling method. Those who were seriously ill, and who had cognitive impairment and pregnant women with gestational hypertension were excluded. Out of 420 patients, with the exclusion of 10 patients who did not meet the inclusion criteria or who were not available on the day of data collection, a total of 410 (97.6%) patients signed the consent form and voluntarily agreed to participate in this study.

Procedures

Researcher got permission from Township Public Health Department after receiving ethical approval by the Committee for Research Ethnics (Social Sciences), Mahidol University, Thailand (No. 2019/070.0204) and Institutional Review Board, University of Public Health, Yangon, Myanmar (UPH-IRB-2019/Research/20). The research was coordinated with 5 public health practitioners, another 5 certified midwives, and community authorized persons to select the sample and to make appointments with subjects. The survey and anthropometric measurements were conducted at the subjects' home. The researcher trained them on study protocols, techniques on interview and on measuring anthropometrics according to WHO guidelines before the survey. Before conducting the interview, the purposes and procedure of data collection were explained. Participants were also informed about protection of their rights and agreement, and a written informed consent was obtained from each participant. The information from data was kept confidentially. After subjects agreed to participate and signed a written informed consent, they were interviewed face to face using structured questionnaires and then their body weight and height were measured.

Measurement

Knowledge of hypertension was measured by Hypertension Knowledge Level Scale questionnaire developed by Sultan et al in 2012.[20] The questionnaire was composed of 22 items. It sought knowledge on definition of hypertension, life-style, treatment, adherence to medication and complications of hypertension. Each item was prepared as part of a standard answer (Correct, Incorrect, or Don't Know) and score ranged from 0–22. Participants with a total score of 18.0 or above were considered as having an adequate level of knowledge and the rest were

inadequate according to the cutoff scores of the original study.[20] The scale was validated in Iranian population[20] and the Cronbach's alpha was also good at 0.82 in the original study and 0.68 in this study.

Social support was measured by Multidimensional Scale of Perceived Social Support (MSPSS) questionnaire developed by Zimet et al.[21] It has 12 items which seek answers to social support from family, friends and significant other. The MSPSS is a self-report instrument with 12 items that were rated on a 7-point Likert scale. Responses ranged from 1 (strongly disagree) to 7 (strongly agree) and score ranged from 1 to 7. It was categorized as low support (mean scored <3), moderate (mean scored 3–5), high (mean scored >5) according to the cutoff scores of the original study.[21] It is reliable as the Cronbach's alpha was 0.88 in the original study and 0.92 in this study.

Perceived self-efficacy to manage hypertension was measured using Perceived Self-Efficacy to Manage Hypertension Scale questionnaire, developed by Warren-Findlow et al.[22] It has 5 items which sought answer to the level of confidence in managing hypertension and responses were ranged from 1 (not confident at all) to 10 (totally confident) and possible score ranged from 5 to 50. It was classified as good level with a mean score of 9 or above while the rest were poor level. It was validated in African American population and the reliability was good at 0. 81 in the original study[22] and 0.79 in this study.

Multiple self-care behaviors were measured by Hypertensive Self-Care Activity Level Effect questionnaires (H-scale) developed by Warren and Seymour.[23] It is a 30 item scale which has 6 subdomains (adherence to antihypertensive medication, following healthy diet, engagement in adequate physical activity, practicing proper weight management, avoidance of tobacco use and abstinence from harmful alcohol drinking). It was designed to be utilized in health care settings and epidemiological surveys to assess self-care behaviors of hypertensive patients.[24] The cutoff points in this scale were according to the original study's classification.[23] Components of H-scale are as followed.

i) Medication adherence was measured by 3 items which assessed number of days in the last week in which participants followed prescribed medicines. Responses were summed (score ranged from 0–21). Participants who got full scores of 21 were categorized as adherers. Internal consistency was excellent at 0.93 in the original study and 0.98 in this study.

ii) Healthy diet was assessed by 11 items of consumed diets which have been recommended by DASH. As some foods in the original study were not commonly available in Myanmar, the item #7 was modified from "Eat pickles, olives, or other vegetables in brine?" to "Eat salty foods such as fish sauce, fermented fish (Nga-Pi), salty dried fish or vegetables in brine?" which was reversely coded. Responses were summed (score ranged from 0–77) and categorized as low diet quality (scored ≤ 32); medium (33–51) and high quality diet (>52). Internal consistency ranged from 0.77–0.83 in the original study and 0.56 in this study.

iii) For physical activity, there were 2 items asking questions on physical activity as parts of daily life and doing specific exercise in the last 7 days. Responses were summed (score ranged from 0–14). Participants scored an 8 or higher were coded as adherers, the rest were non-adherers.

iv) For tobacco use, there were 2 items asking about tobacco use by him/herself and passive smoking. For the question asking about tobacco use, since chewing betel nuts (composed of betel leaves, tobacco, slaked lime and other chemical substances) is common in Myanmar, the item #17 was modified from "Smoke a cigarette or cigar even just one puff?" into "Smoke a cigarette or cigar even just one puff or chew betel nuts?". Responses were summed (scores ranged from 0–14). Respondents who scored 0 were considered as adherers, the rests were non-adherers.

v) For weight management, there were 10 items which assessed practices in managing body weight in the past 30 days. They were based on a 5-point Likert scale ranging from 1 (strongly

disagree) to 5 (strongly agree). The score ranged from 0 to 50. Participants who scored 40 and above were categorized as adherers. All others were non adherers. Internal consistency was good at 0.90 in the original study and 0.79 in this study.

vi) Alcohol intake was accessed by 2 items, asking the number of days they consumed alcohol in a week on average and number of units of alcohol they consumed on each of those days. One unit of alcohol was defined according to national guideline.[25] In this study, one unit is considered to be equivalent to half pint of beer, 100 ml of wine (10% alcohol), spirits 25 ml (40% alcohol). The score was calculated by multiplying those two questions, which is the number of units he/she drank in a certain week. Male participants who drank 14 and lower units, female respondents who drank 7 and lower units in a certain week were considered as adherers. The others were considered as non-adherers.

Participants' weight was measured by digital scales to the nearest 0.1 kg, and height by wooden height measuring boards to the nearest 0.5 cm according to WHO guideline.[26] Body Mass Index (BMI) was calculated by the formula as weight/height^2 and classified into four categories according to guidelines for Asian adults[27]: Underweight (BMI < 18.5), normal weight (18.5 ≤ BMI < 23.0), overweight (23.0 ≤ BMI < 27.5), and obese (BMI ≥ 27.5).[28]

Statistical Analysis

The data were analyzed in SPSS version 22.0. Descriptive statistics (frequency and percentage) were used to describe sample distributions. Chi-square tests was used to identify the associated factors. Co-variates with p-value <0.05 in univariate analysis were entered into multiple logistic regression using backward method to identify predictors to being non-adherent to each of self-care behaviors. However, logistic regression models were not performed for two self-care behavior indicators, such as healthy diet and alcohol intake (prevalence of 2.7% and 97.8%, respectively), because the likelihood function of logistic regression model may not converge.

RESULTS

A total of 410 hypertensive patients participated in this study. This study found that mean systolic and diastolic blood pressure of study subjects were 138.8 ± 20.9 mmHg and 89.2 ± 12.8 mmHg, respectively and body weight and height were 58.9 ± 13.4 and 153.9 ± 7.3, respectively (Table 1).

Majority of the participants were women with mean age of 55.4 ± 10.9 years. Furthermore, most of them were Kachin ethnics (58.1%), from low household income family (<100,000 Myanmar Kyats (MMK) per month approximately equal to 66 US Dollar (USD)) (43.9%), and primary school level (40.2%) (Table 2). Moreover, more than half of them were overweight and obese (64.9%), had inadequate knowledge of hypertension (54.9%), had poor self-efficacy to manage hypertension (80.7%) and had high social support (77.6%).

Table 1 shows the prevalence rates of adherence to hypertensive self-care behaviors which were relatively low in this sample: avoidance of tobacco use at 50.2%, followed by physical activity at 24.9%, antihypertensive medication at 24.1%, weight management at 9.5%, and healthy diet at 2.7%, while abstinence from harmful alcohol drinking was high at 97.8%.

Table 2–5 shows the association between independent variables and self-care behaviors using Chi-square test. Factors having a p-value <0.05 in the bivariate analyses were analyzed using multiple logistic regression analyses (Table 6). For medication adherence, age, education, occupation, monthly family income, duration of hypertension, knowledge, comorbidity, and self-efficacy, which were associated with Chi-square tests (p<0.05), were entered in multiple

Table 1 Prevalence rates of self-care behaviors among hypertensive patients

Variables	Total	Male	Female
	n (%)	n (%)	n (%)
Blood pressure (Mean ± SD)			
Systolic blood pressure (mmHg)	138.8 ± 21.0	146.6 ± 20.7	136.4 ± 20.5
Diastolic blood pressure (mmHg)	89.1 ± 12.8	93.5 ± 13.4	87.8 ± 12.4
Anthropometric measurement			
Weight (kg)	58.9 ± 13.4	64.2 ± 13.2	57.3 ± 13.1
Height (cm)	153.9 ± 7.3	161.0 ± 7.3	151.8 ± 5.8
Adherence to antihypertensive medication*			
Yes (≥21 scores)	99 (24.2)	24 (25.0)	75 (23.9)
No (<21 scores)	311 (75.9)	72 (75.0)	239 (76.1)
Adherence to healthy diet*			
Low diet quality (<33 scores)	255 (62.2)	59 (61.5)	196 (62.4)
Medium diet quality (33–51 scores)	144 (35.1)	35 (36.5)	109 (34.7)
Adherent (>51 scores)	11 (2.7)	2 (2.1)	9 (2.9)
Adequate physical activity*			
Yes (≥8 scores)	102 (24.9)	39 (40.6)	63 (20.1)
No (<8 scores)	308 (75.1)	57 (59.4)	251 (79.9)
Adequate body weight management*			
Adherence (≥40 scores)	39 (9.5)	12 (12.5)	27 (8.6)
No adherence (<40 scores)	371 (90.5)	84 (87.5)	287 (91.4)
Avoidance of tobacco use*			
Adherence (<1 score)	206 (50.2)	41 (42.7)	165 (52.5)
Not Adherence (≥1 scores)	204 (49.8)	55 (57.3)	149 (47.5)
Avoidance of harmful alcohol drinking*			
Yes (≤14 scores for Male and ≤7 for Female)	401 (97.8)	91 (94.8)	310 (98.7)
No (>14 scores for Male and >7 for Female)	9 (2.2)	5 (5.2)	4 (1.3)

*Multiple self-care behaviors were measured by Hypertensive Self-Care Activity Level Effect question-naires (H-scale)

logistic regression analysis. Younger patients (30–45 years) (AOR = 3.12), low monthly family income (AOR = 2.32), inadequate knowledge in hypertension (AOR = 2.47), and no comorbidity (AOR = 2.04) were associated with being non-adherent to antihypertensive medication. For adherence to weight management, education, place of residence, family history of hypertension, and self-efficacy were entered in the logistic regression model. Those being non-adherent to weight management were more likely for patients living in rural area (AOR = 4.37) and having poor self-efficacy (AOR = 3.54). For adherence to physical activity, age, gender, occupation, place of residence, self-efficacy was included in the regression model, younger patients (AOR = 2.68), female (AOR = 2.24), and having poor self-efficacy (AOR = 2.32) were associated with being non-adherent to physical activity.

Ethnicity and distance to health facility were entered in the regression model. The result showed that compared with Kachin, other ethnics (Burmese, Shan and others) were more likely to be non-adherent to avoidance of tobacco use (AOR = 1.51).

Table 2 Association between socio-demographic factors and adherence to self-care behaviors among hypertensive patients

	Total		Medication (%)			Weight management (%)			Physical activity (%)			Avoidance of tobacco use (%)		
	n	(%)	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Age (Years)														
30–45	85	20.7	12.9	87.1	**0.016**	7.1	92.9	0.687	14.1	85.9	**0.008**	9	91	0.552
46–60	176	42.9	25	75		10.2	89.8		23.9	76.1		11.1	88.9	
61–70	149	36.3	29.5	70.5		10.1	89.9		32.2	67.8		53.7	46.3	
Gender														
Male	96	23.4	25	75	0.829	12.5	87.5	0.254	40.6	59.4	**<0.001**	42.7	57.3	0.092
Female	314	76.6	23.9	76.1		8.6	91.4		20.1	79.9		52.5	47.5	
Marital Status														
Living without partner	132	32.2	24.2	75.8	0.975	7.6	92.4	0.357	22.7	77.3	0.488	48.5	51.5	0.624
Living with partner	278	67.8	24.1	75.9		10.4	89.6		25.9	74.1		51.1	48.9	
Ethnicity														
Kachin	238	58.1	21.4	78.6	0.13	8	92	0.214	24.8	75.2	0.167	55	45	**0.022**
Others	172	42	27.9	72.1		11.6	88.4		25	75		43.6	56.4	
Education level														
No education and Primary school	241	58.8	20.3	79.7	**0.031**	6.2	93.8	**0.007**	22.4	77.6	0.167	47.3	52.7	0.155
Middle school to bachelor's degree	169	41.2	29.6	70.4		14.2	85.8		28.4	71.6		54.4	45.6	
Occupation														
Employed	84	20.5	25	75	**0.004**	14.3	85.7	0.207	32.1	67.9	**0.021**	47.6	52.4	0.73
Farmer	176	42.9	18.2	81.8		7.4	92.6		18.2	81.8		49.4	50.6	
Dependent/housewife/others	150	36.6	30.7	69.3		9.3	90.7		28.7	71.3		52.7	47.3	
Family income (MMK/month)*														
Low (5,000–100,000)	180	43.9	17.2	82.8	**<0.001**	7.8	92.2	0.366	21.1	78.9	0.226	46.7	53.3	0.376
Middle (100,001–250,000)	102	24.9	24.5	75.5		8.8	91.2		25.5	74.5		51	49	
High (>250,000)	128	31.2	33.6	66.4		12.5	87.5		29.7	70.3		54.7	45.3	
Place of Residence														
Urban	77	18.8	40.3	59.7	0.071	23.4	76.6	**<0.001**	36.4	63.6	**0.01**	57.1	42.9	0.179
Rural	333	81.2	20.4	79.6		6.3	93.7		22.2	77.8		48.6	51.4	

* 1 US$ ≈ 1500 Kyats. Percentages (%) were presented.

Table 3 Association between personal factors and adherence to self-care behaviors among hypertensive patients

	Total		Medication (%)			Weight management (%)			Physical activity (%)			Avoidance of tobacco use (%)		
	n	(%)	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Duration of Hypertension														
<4 years	167	40.7	19.8	80.2	**0.041**	7.2	92.8	0.183	27.5	72.5	0.3	48.5	51.5	0.559
≥4 years	243	59.3	27.2	72.8		11.1	88.9		23	77		51.4	48.6	
Family History of Hypertension														
Yes	169	41.2	22.5	77.5	0.556	13.9	86.1	**0.021**	22.5	77.5	0.398	53	47	0.398
No/Don't Know	241	58.78	25.1	74.9		6.9	93.1		26.3	73.7		48.6	51.4	
Body Mass Index														
Normal weight/underweight (<23.0 kg/m²)	144	35.1	21.5	78.5	0.362	9.7	90.3	0.915	29.9	70.1	0.86	52.1	47.9	0.584
Overweight and obese (≥23.0 kg/m²)	266	64.9	25.6	74.4		9.4	90.6		22.2	77.8		49.2	50.8	
Knowledge in hypertension														
Inadequate (<18)	225	54.9	16.9	83.1	**<0.001**	8.9	91.1	0.635	23.6	76.4	0.495	49.3	50.7	0.684
Adequate (≥18)	185	45.1	33	67		10.3	89.7		26.5	73.5		51.4	48.6	
Comorbidity														
Yes	170	41.5	31.2	68.8	**0.005**	11.2	88.8	0.334	24.1	75.9	0.764	51.7	48.3	0.494
No	240	58.5	19.2	80.8		8.3	91.7		25.4	74.6		48.2	51.8	

Percentages (%) were presented.

Table 4 Association between psychological factors and self-care behaviors among hypertensive patients

	Total		Medication (%)			Weight management (%)			Physical activity (%)			Avoidance of tobacco use (%)		
	n	(%)	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Self-rated physical health														
Good to Excellent	75	18.3	18.7	81.3	0.22	9	91	0.421	32	68	0.114	54.7	45.3	0.397
Fair to Poor	335	81.7	25.4	74.6		11.1	88.9		23.3	76.7		49.3	50.7	
Self-efficacy														
Poor (<9 scores)	331	80.7	22.1	77.9	**0.043**	6.9	93.1	**<0.001**	21.1	78.9	**<0.001**	49.5	50.5	0.563
Good (≥9 scores)	79	19.3	32.9	67.1		20.3	79.7		40.5	59.5		53.2	46.8	

Percentages (%) were presented.

Table 5 Association between socio-environmental factors and self-care behaviors among hypertensive patients

	Total		Medication (%)			Weight management (%)			Physical activity (%)			Avoidance of tobacco use (%)		
	n	(%)	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
Social support														
Low (1–2.9 scores)	11	2.7	18.2	81.8	0.878	0	100	0.139	27.3	72.7	0.21	27.3	72.7	0.275
Moderate (3–5 scores)	81	19.8	23.5	76.5		4.9	95.1		17.3	82.7		53.1	46.9	
High (5.1–7 scores)	318	77.6	24.5	75.5		11	89		26.7	73.3		50.3	49.7	
Distance from health facility														
<1 mile	232	56.6	24.6	75.4	0.355	9.9	90.1	0.596	25.9	74.1	0.869	44	56	**0.01**
1–5 miles	152	37.1	21.7	78.3		9.9	90.1		23.7	76.3		59.9	40.1	
>5 miles	26	6.3	34.6	65.4		3.8	96.2		23.1	76.9		50	50	
Perspectives on cost of medication														
Expensive/very expensive but can manage	82	20	24.4	75.6	0.947	9	91	0.607	22	78	0.66	47.6	52.4	0.805
Very expensive, have to borrow	19	4.6	21.1	78.9		11.1	88.9		31.6	68.4		47.4	52.6	
Cheap	308	75.1	24.4	75.6		20	80		25	75		51.3	48.7	
Satisfaction to health care														
Yes	99	24.1	24.2	75.8	0.827	9	91	0.421	24.9	75.1	0.809	50.4	49.6	0.645
No	311	75.9	20	80		11.1	88.9		20	80		40	60	

Percentages (%) were presented.

Table 6 Final model of multiple logistic regression analysis for the predictors of self-care behaviors of hypertensive patients

	No adherence to medication[1]		No adherence to weight management[2]		No adherence to physical activity[3]		No adherence to avoid tobacco use[4]	
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
Age (Years)								
30–45 vs. 61–70	**3.12**	**(1.47–6.62)**	–		**2.68**	**(1.29–5.53)**	–	
46–60 vs. 61–70	N.S.		–		N.S.		–	
Gender (Female vs. Male)	–		–		**2.24**	**(1.39–3.94)**	–	
Ethnicity (Other vs. Kachin)	–		–		–		**1.51**	**(1.01–2.25)**
Education (Secondary school+ vs. Primary school–)	–		N.S		–		–	
Monthly family income								
Low vs. High	**2.32**	**(1.33–4.07)**	–		–		–	
Middle vs. High	N.S.		–		–		–	
Place of residence (Rural vs. Urban)	–		**4.37**	**(2.14–8.94)**	N.S		–	
Family history of hypertension (No vs. Yes)	–		N.S		–		–	
Occupation								
Employees vs dependent/housewife/other	N.S.		–		N.S		–	
Farmer vs dependent/housewife/other	N.S.		–		N.S		–	
Duration of hypertension (<4 yrs vs. ≥4 yrs)	N.S.		–		–		–	
Knowledge (Inadequate vs. Adequate)	**2.47**	**(1.52–4.01)**	–		–		–	
Comorbidity (No vs. Yes)	**2.04**	**(1.26–3.32)**	–		–		–	
Self-efficacy (Poor vs. Good)	N.S		**3.54**	**(1.71–7.32)**	**2.32**	**(1.35–4.00)**	–	
Distance from health facility								
<1 mile vs. >5 miles	–		–		–		N.S	
1–5 miles vs. >5 miles	–		–		–		N.S	

AOR = Adjusted odd ratios, CI = Confidence interval, N.S = Not significant, "-" = Variables were not included in the model
Multiple logistic regression using backward elimination method was used.
1) Variables included in the Model were age, monthly income, occupation, duration of hypertension, knowledge in hypertension, comorbidity and self-efficacy.
2) Variables included in the Model were residence, education, family of hypertension and self-efficacy.
3) Variables included in the Model were age, gender, occupation, place of residence and self-efficacy.
4) Variables included in the Model were ethnicity and distance from health facility.
Bold font indicates statistical significance.

DISCUSSION

The aim of this study was to identify the prevalence and associated factors of multiple self-care behaviors among patients with hypertension. Generally, the prevalence rates of multiple self-care behaviors were very low except adherence to avoidance of harmful alcohol drinking. Prevalence of adherence to medication (24.2%) was lower than the result obtained from a hospital based study in Yangon (50%).[16] It might be probably due to a majority of community-dwelling patients in our study were minority ethnics living in rural areas and with low socio-economic status. Thus, they might not afford medication cost due to out of pocket expenditure.[29]

Our results indicated that younger respondents (30–45 years) were more likely to be non-adherent to medication than older ones, this is in agreement with a study by Han et al[16] and Boima et al.[30] As people become older, they seemingly start giving more attention to their own health and take medication in a regular manner, while younger individuals might be busy and forgot to take medicines. Similar to studies by Okoro and Ngong[31] and Khanam et al,[32] respondents with lower income were more likely to be non-adherent to medication. Indeed, in our study, those from low-income families reported that they had to borrow money for medication (data not shown). It might indicates that poor family income is one of the challenges to adherence to medication and there is a need for financial risk management program like universal health coverage in Myanmar. Moreover, while over half of the respondents (54.9%) had inadequate knowledge, which was associated with being non-adherent to medication in accordance with studies of Boima et al[30] and Jankowska-Polańska et al.[33] A well designed health education program about hypertension and self-care skills should therefore be implemented.

Although DASH diet rich in vegetables and fruits helps to reduce high blood pressure and prevent its complications,[34,35] very few respondents in our study adhered to DASH quality diet at 2.7% which is lower than studies in India,[36] America,[23] and Spain.[37] Our study also revealed that the prevalence of fruits and vegetables consumption of 5 servings or higher was only 11.7%. It is supported by a study in Myanmar which indicated that those who ate 5 servings of fruits and/or vegetables on the average per day were considerably low at 13.4% in general adult population.[11] Thus, health promotion education for DASH diets should be implemented to encourage individuals to follow its recommendation among hypertensive patients in Myanmar.

Various studies revealed that lack of physical activity is one of the risk factors of hypertension,[38,39] and adequate physical activity can help to reduce high blood pressure.[6] WHO also suggested that engaging 30 minutes of moderate level physical activity for five days a week help prevent and control hypertension.[40] However, only one-fourth of the respondents in our study engaged in adequate physical activity which is lower than the results of studies in China,[41] Indonesia,[42] and Ethiopia.[43] Furthermore, being non-adherent to engage in adequate physical activity was associated with being younger, female, and poor self-efficacy to manage hypertension. Thus, self-efficacy should be considered as a proximal factor to improve self-care, particularly adequate physical activity.

Although, tobacco use increases blood pressure and leads to serious complications,[44] only half of the respondents reported they avoided tobacco use which is higher than the results of a hospital based study in Yangon[16] and studies in China.[41,45] In addition, our study showed that although 88.7% of respondents avoided active smoking, only half of the respondents avoided passive smoking at 52.4%. It is supported by a nation-wide survey in Myanmar which reported that 55% of adults were exposed to passive smoking.[46] In particular, smokeless tobacco use is deep rooted and a source of increasing health concern in Myanmar.[47] Furthermore, other ethnics (Burmese, Shan and others) were more likely to be non-adherent to avoidance of tobacco use than Kachin ethnic. Thus, there is a need for strong policy to establish smoke-free environment

and culturally specific tobacco cessation program.

Researchers found that reducing body weight leads to a significant decrease in high blood pressure than pharmacological treatment alone.[48,49] Although, over half of the respondents (64.9%) were overweight and obese, only 9.5% managed their body weight in this sample which is lower than other studies among Iranians[50] and African Americans.[22,23] The potential explanation is that they might not perceive their accurate body weight and failed to manage it. Hypertensive patients should therefore be informed their body weight status and interventions to manage their body weight should be implemented. Moreover, a majority of respondents reported that they abstained from harmful alcohol drinking in this study. It might be probably due to the fact that alcohol drinking is not culturally acceptable and most of the respondents seem highly religious.

Our study has several limitations. First, the temporal sequence of associations between exposures and outcome is uncertain due to the nature of a cross-sectional study. Also, since the study was conducted in a single geographical area, the results may not be generalizable to other settings and populations in Myanmar. Despite these limitations, to the best of our knowledge, this study is one of a few studies on this topic in Southeast Asia, and describes the prevalence of self-care behaviors and its determinants among hypertensive patients, which may guide policy makers to formulate intervention strategies. Second, these subjects were selected based on their residence by multi-stage random sampling techniques, although they were limited to those registered in health centers. Moreover, this study can provide some valuable insights into self-care behaviors among minorities residing in urban or rural areas as the information on such minorities were very limited in Myanmar.

In conclusion, although almost all of the respondents adhered to abstain from harmful alcohol drinking, adhere to medication, follow healthy diet, engage in adequate physical activity, adopt good weight management practices and avoid tobacco use were very low. Health professionals should therefore consider appropriate intervention measures to improving self-care behaviors and to reduce premature deaths caused by hypertension in Myanmar.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare for this study.

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